Using STEM & PBL to Combat New Challenges in Education

After reevaluating curriculum during the pandemic, educators identify opportunities for improvement. Take a look at some of the top challenges faced by the education community and how STEM & PBL helped overcome them.
Integrating STEM project-based learning into daily classrooms dramatically combats many of the challenges educators have faced in the pandemic learning environment we have found ourselves in for the last 15 months. At the risk of a gross understatement, the COVID pandemic has made learning difficult for students and challenging for teachers. Many educators have reevaluated their curriculum and identified opportunities for improvement based on what they’ve observed. Below we look at some of the top challenges faced by the education community and how STEM can help overcome them.

PROBLEM #1: LACK OF MOTIVATION

“With a lack of motivation comes laziness for many people. We lack the energy necessary to do big tasks including everyday simple tasks. It’s very common with high school students especially this year because it’s easy to just stay in bed all day and not do anything,” states Lizbeth Castillo Sanchez, high school student at Maywood High School.¹

At first, remote learning was a novelty. Sitting at home in your pajamas while “going to school” was fun. But, that novelty wore off quickly, and, as stated by National Geographic, “Zoom fatigue is real.”² Taxing both brain and psyche, remote and hybrid learning has taken the lack of motivation in students to a whole new level.

“Motivation is a central part of a student’s educational experience from preschool onward,” noted the Center on Education Policy. So, what do we do now? First, let’s look at what drives motivation in students. Students can be motivated by a desire to please parents or teachers, a deep interest in a topic, or prior success in a specific subject. Because educators cannot always influence or control these variables, intrinsic motivation works best when students are confident in their abilities and know how to take a step-by-step approach to problem solving. And that’s where STEM learning comes in.
ACTIVE PROBLEM SOLVING IMPROVES MOTIVATION

SOLUTION:
STEM IMPROVES MOTIVATION THROUGH ACTIVE PROBLEM SOLVING

Using a project-based approach, STEM fosters a step-by-step approach through active exploration of real-world challenges and problems. By using a dynamic classroom approach, students gain deeper knowledge through active exploration and engineering processes. The steps to problem solving can include determining objectives and constraints, prototyping, and testing and evaluation.

Once students have mastered these steps, anything is possible! Real-world challenges can be met head on using a step-by-step approach to find a solution. And once a solution has been created, students' confidence (and intrinsic motivation) levels rise. Using a project-based approach through STEM, educators grow their classrooms into a community of lifelong learners who are self-assured and inspired.
PROBLEM #2: 
**DECREASE IN SOCIAL-EMOTIONAL WELL BEING**

In a recent New York Times article, mental health experts expressed “worry about the psychological toll on a younger generation that was already experiencing soaring rates of depression, anxiety and suicide before the pandemic.” When schools closed due to the pandemic, an estimated 55 million students were cut off not only from the classroom, but also those school staff members who provided guidance counseling, advice for building self-esteem, and help coping with peer pressure and even trauma. When you add the fears and uncertainty of the pandemic on top of students’ stressors, you have what many are calling “the perfect storm.”

By focusing on SEL (social and emotional learning), students and staff alike learn to apply the knowledge, attitudes and skills necessary to “understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions.” According to National University, “Students who participated in SEL programs saw an 11 percentile increase in their overall grades and better attendance.”

**SOLUTION:**
**STEM ALIGNS WITH SOCIAL-EMOTIONAL LEARNING**

STEM drives social-emotional learning? Is that even possible? Yes. In fact there are a lot of ways that STEM and SEL complement each other. They both teach creative problem solving and persistence. And the collaborative nature of STEM learning alone opens up SEL opportunities tenfold. We’ve also found that the STEM curriculum promotes character virtues such as generosity, collaboration, creativity, and curiosity - all key components of social-emotional well being.

Let’s talk about how computer science tools like coding and robotics can help students’ overall character development. When students learn and practice logical progressions, loops, if-then statements, they develop practical problem-solving skills that encourage them to try and fail, and then to try all over again. Students report a deep connection with their work and express satisfaction through their successes.
Coding tasks require attention to detail and focus. When experimenting with loops, students begin to learn how their own actions and decisions can impact others in a positive or negative way. By relating these concepts for students, teachers help them understand these commonalities in a broader sense which enhances SEL development.

**Why is this important?** Going forward, it’s clear that the number of STEM jobs will continue to rise, and that in turn will require students to develop a great deal of technical skill and understanding. As the field continues to evolve, it’s also becoming increasingly clear that developing soft skills needs to go hand-in-hand with the development of technical know-how. Because these two skill sets are related to future career success, educators must look to creative ways to merge the technical and the social-emotional learning.

When STEM and SEL are combined at an early age, students thrive in both areas. Studies show that the earlier a child is introduced to something, the more profound the impact on future success. We’ve seen that with early literacy and numeracy, and the same is true for technical skill development and social-emotional learning. By giving younger students hands-on opportunities, teachers unlock their innate curiosity. Without the constraints of prior experience, these same children also learn that they can create new things, design solutions, and work together to solve a problem.
PROBLEM #3: LEARNING LOSS

Learning loss is not a happy or easy topic, but there is no doubt that our learners have been impacted by the change in learning modalities during the Covid-19 pandemic. In fact, according to McKinsey, students on average could lose five to nine months of learning by the end of June 2021. That's one reason why the American Rescue Plan (ARP) specifically calls out Learning Loss in its language and provides monies to address a remedy. Is that learning loss inevitable? Of course not. Some students thrived in a remote environment; others learned new ways of approaching these unprecedented challenges.

But we're all too aware as an education community of the 'summer slide' concept; multiply that known phenomenon by 2020 and you have a recipe for disaster. Research on summer learning (loss or gain) points to the importance of personalized instruction. If a student did not lose much ground over the summer (or pandemic) we don't want them to be bored with unnecessary remediation. If a student lost significant ground during that same time, we don't want them left behind. Personalizing instruction in the early days of a school year (or after a pandemic) can lead to greater gains for both sides of the equation and ultimately lead to greater equity of opportunity for all.

SOLUTION: USE PROJECT-BASED LEARNING AS A PERSONALIZED INSTRUCTION APPROACH

We combat learning loss not by drill-and-review solutions that focus on knowledge acquisition but by project-based learning that deeply engages students with the material they are trying to master. Robotics tools give students at all grade levels the opportunity to engage and learn computer science, and using a robotics progression model is an effective way of meeting all students, regardless of age or sophistication, where they are. Educators do not instruct simply on coding; they collaborate with students, build teamwork skills, and facilitate as students cooperatively learn and grow together. In
addition to the obvious social-emotional benefits, STEM learning through robotics provides the kind of project-based immersion where students at all levels can thrive. Learning with robotics is more about what students are able to do with that technology to show their understanding of key concepts rather than manipulating the device itself. Tech tools like these help students recognize patterns, work together, communicate thoughts, and creatively solve problems, all of which make up the computational thinking process. And project-based learning through robotics can be introduced at any stage of learning - from early elementary ages all the way through high school. Educators can group peers according to their relative strengths and/or create unique teams where the students each take leadership roles in their areas of expertise. The job of the educator becomes one of guide on the side versus sage on the stage. Students learn to rely on their teammates to solve problems and arrive at the solutions together.
Integrating STEM into the curriculum doesn’t have to be arduous. In fact, it’s fun and relatively easy. Here are a few ways to enrich your learning environment with STEM:

1. Offer remote classes/summer classes for students or teachers. Check out courses for students and teachers.

2. Build cross-curricular learning teams in your district/schools that can incorporate STEM into multiple areas in your schools. Check out grade-band STEM curriculum.

3. Invest in professional development. Check out free PD sessions in relevant topics around STEM or get certified training in STEM curriculum and equipment usage.

4. Invest in emerging technologies. Check out classroom ready equipment.

NextWave STEM is ready to create the STEM program of your dreams. From our We Teach options to summer and afterschool programs, we welcome the opportunity to partner with you. Reach out to us at Info@NextWaveSTEM.com or visit our website, NextWaveSTEM.com to learn more.

References:
4. “What is SEL?” Social Emotional Learning (SEL) Tools, 14 June 2021, mylearningtools.org/what-is-sel/?gclid=CjwKCAjWyVzhvzFBhDxAwRsACjwL3dEL8sAKh-AjPeccoCzLJvZoyyOxgWPf4a8bKollULaz_CG0ASmTrYaIiDEAIAwLw_wcB.